Volume 4 Number 3 *Supporting NASA's LTP* March 19999

Learning Technologies Project Bulletin

Brought to you by NASA, TRW, & West Virginia University

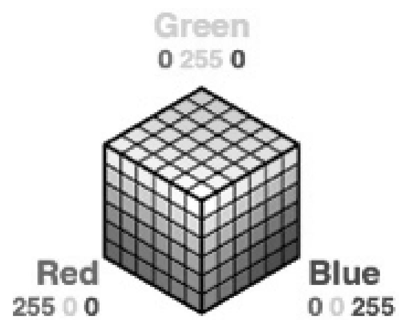
Nothin' but Net

The Limits of Web-Safe Colors

Rudy Hoffert
rhoffert@rspac.ivv.nasa.gov

Web browsers support a table of 216 colors, and although the colors can vary slightly from system to system, they are essentially the same. The basic Web-safe color palette is based on the RGB color spectrum. RGB stands for red, green, and blue, the colors that are the most easily seen by the human eye. RGB colors are described by three components, numbered from zero to 255. The 216 different colors come from the division of the RGB cube. The RGB cube is made up of three axes: ZYX.

By cutting each axis of the cube into twenty-percent increments, six slices are created. With six different possible values in each of the three components, a total of 216 different colors are made.



Web browsers use a hexadecimal HTML code for each and every Web-safe color. The hexadecimal number is a six-character code with two characters for each of the three colors (RGB).

To make the 216 Web-safe colors easier to remember, a company called VisiBone has created the Anglo-Centric Color Code. This color code gives every color a name and an abbreviation. The VACCC (VisiBone Anglo-Centric Color Code) abbreviation is a one- to three-letter code derived from the VACCC name. The abbreviation uses the first letter of each part of the VACCC name. For example: "White" would have an abbreviation of "W" and "Medium Weak Blue" be "MWB."

Because browsers can only display 216 colors, there are limits to Web design, but browsers have the ability to dither colors to create colors unknown to the browser. Dithering occurs when the computer draws the image by alternating pixels near the one specified. Dithering can be very useful if done correctly. By dithering two or three browser-safe colors, it is possible to make over 10 million different color combinations. The only real setback to dithering is that sometimes colors become speckled.

With 216 Web-safe colors and 10 million different dithering combinations, the production of exciting Web pages is limited only by the creator's imagination.

The VisiBone Anglo-Centric Color Code is at **http://www.visibone.com/colorlab/vaccchue.html** and ColorMix is at **http://www.colormix.com.**

News Bytes

LTP Products Represented at San Antonio Conferences

Scott Gillespie
sgillespie@rspac.ivv.nasa.gov

The Remote Sensing Public Access Center (RSPAC) recently attended the Society for Technology and Teacher Education (SITE) international conference and the Mathematics/Science Education & Technology (M/SET) conference, held concurrently in San Antonio.

While there, RSPAC distributed a variety of informative materials touting NASA's Learning Technologies Project and met with educators from across the United States. RSPAC also conducted a two-hour presentation on how NASA's LTP tools are ideal for classroom use and, through its staffed and interactive display booth, exhibited examples of those tools developed by the many LTP-affiliated groups.

"By attending both conferences, we were able to spread the word about LTP and its many benefits to a large, diverse group of educators and decision makers," said Phyllis Griggs, Learning Technologies Project coordinator. "We felt the conferences were very beneficial to the promotion of NASA's Learning Technologies Project and the many groups that comprise it."

Griggs praised the work of the Johnson Space Center's Stephanie Smith, who gave a very well-received presentation on NASA Qwhiz!, an Internet game created for K-12 students and teachers. Schools around the nation can compete in live, head-to-head NASA Qwhiz tournaments in which they are tested on their knowledge of NASA's missions. For more information or to test your knowledge on Qwhiz!, visit the site at **http://prime.jsc.nasa.gov/Qwhiz.**

In the Spotlight

Live From the Sun Now Highly Interactive

Eileen Bendixsen
eb@passporttoknowledge.com
Geoffrey Haines-Stiles
ghaines@mail.arc.nasa.gov

Live From the Sun, the hottest multimedia education project in the solar system, has now become highly interactive, thanks in part to programming and creative support from RSPAC.

The first video, *Our Sun in Close-Up*, aired on Tuesday, March 16, at 1:00 p.m. Eastern. The program explains that without the Sun there would be no life on the surface of the Earth. It addresses the fact that over the next few years the Sun and its interaction with our planet and our lives will be increasingly in the headlines as solar maximum unleashes more and more violent eruptions of matter and energy.

But solar max is not just another Y2K problem, it's also the chance to appreciate the star of our solar system as never before. *Our Sun in Close-Up* (to be rebroadcast in the coming weeks and months on NASA-TV) provides a comprehensive update on the amazing discoveries of the past decade, during which NASA spacecraft have returned astonishingly detailed views of the only star we can see...in close-up.

In addition to seeing the Sun in close-up, viewers went behind the scenes at NASA's Goddard Space Flight Center in Greenbelt, MD, the mission control center for many of America's solar spacecraft. They also saw the Lockheed Martin Solar and Astrophysics Laboratory in Palo Alto, CA, where some of the most powerful telescopes aboard recent spacecraft have been built and tested. The program visits NOAA's Space Environment Center in Boulder, CO, World Warning Center for the space weather we'll hear more and more about in the coming years. The largest solar telescopes on Earth, at the National Solar Observatory sites at Kitt Peak, AZ, and the appropriately named Sunspot, NM, were also seen. The program invites viewers, through special graphics sequences, to go online to find out more about the people, places, and research processes seen on camera via the Study the Sun section of the project's Web site at **http://passport.ivv.nasa.gov/sun**.

As with every Passport to Knowledge program, the science comes to life through personalized tours offered by the enthusiastic men and women who work on this most exciting research frontier. At Kitt Peak, Detrick Branston opens the Vacuum Tower telescope and shows visitors around. At Lockheed Martin, engineers Barbara Francis, Bruce Jurcevich, and Mike Levay walk through the spacecraft assembly line where the TRACE and Yohkoh telescopes were built. At Sacramento Peak, incoming NSO director Steve Keil shows visitors around the observatory and the hilltop community that has been his home for the past two decades. Astronomer Thomas Rimmele visits the top of an old telescope with new optics.

NASA Goddard researchers Art Poland, Terry Kucera, Barbara Thompson, and Nicky Fox describe how the armada of spacecraft now on watch have brought a new understanding of just how dynamic and changeable even the quiet Sun can be.

Documentary and graphics sequences detail how fusion powers the Sun, and how radiation travels through the radiation and convection zones to the Sun's visible surface, and then to Earth. There is a detailed look at how and why the Sun is a magnetic variable star.

During the broadcast, and for one hour after the program, scientists from NASA's Goddard Space Flight Center, the National Solar Observatory at Kitt Peak, NOAA's World Warming Center, and Lockheed Martin's Solar and Astrophysics Laboratory answered questions submitted by students and teachers participating in Passport to Knowledge's *Live From the Sun* project. This required special on-air software developed by RSPAC and tested during last year's *Live From the Rainforest.*

On Friday, March 5, the first two WebChats with NASA Goddard solar researchers allowed teachers and students to interact with Art Poland and Terry Kucera. The transcripts of the WebChats have been placed on the *Live From the Sun* Web site in the Interact section.

On Friday, March 12, John Leibacher, director of the GONG project, and Frank Hill, a member of the GONG project team, chatted with students and teachers about observing the Sun using helioseismology. The transcripts are currently being edited and will soon be placed on the Web site.

Over the coming weeks, *Live From the Sun* will heat up even more, as researchers from all the agencies noted above wait for a solar event which will be tracked, in near-real-time, via the Web, with students across the country looking on. There will be special bulletins and WebChats to support this online collaborative activity—always a popular and worthwhile component of all PTK projects. The online resources hosted by RSPAC are an integral part of *Live From the Sun*, which PTK describes as 100% video, 100% hands-on, 100% online.

Passport to Knowledge and *Live From the Sun*...real science, real scientists, real locations, real learning.

This bulletin will also be available in Adobe Acrobat format on the Developers' Workshop Web site at: **http://developers.ivv.nasa.gov/collab/pubs/bulletin/**

Highlights & Happenings

LTP Office Supports Two Learning Events in February

Dalia Milgram
dmilgram@mail.arc.nasa.gov

NASA's Learning Technologies Project office supported a NASA Robotics Competition and Jewish Web Week in February. The Robotics Competition included 27 different schools, mainly high schools. It received a great deal of media attention, and was covered by NASA-TV, CNN, cable programming, CBS, Channel 5 (ABC) in San Francisco, Channel 11 (NBC) in San Jose, Channel 39 (ABC) in San Diego, Channel 7 (PBS) in Denver, and Channel 21 (PBS) in Rochester. The competition, held in the NASA Ames hangar in Mountain View, California, was also covered by several radio stations and newspapers. Members of the LTP staff conducted interviews in the Brandeis Hillel Day School, the only middle school to participate in the competition.

The LTP staff also coordinated the Jewish Web Week event and the live interaction between students and their principal from Hativat Zeev in Hertzelia, Israel, and Brandeis' students in Marine, California.

LDAPS Forms New Partnership

Benjamin Erwin
berwin@emerald.tufts.edu

The Lego Data Acquisition and Prototyping System (LDAPS) project at Tufts University recently formed a partnership with the DTeach (Design Technology for America's Children) program of the University of Texas. The partnership was made through LDAPS' contact with National Instruments, the makers of LabVIEW. LabVIEW is the software that LDAPS members used to make ROBOLAB, the graphical programming environment for the LEGO programmable brick.

Ben Erwin recently traveled to the University of Texas to assist with a workshop for elementary school teachers in the Austin Independent School District. The workshop was designed to help them learn about automation, feedback, and control by programming a LEGO device with ROBOLAB.

If you would like to be on the LTP Bulletin mailing list, please send e-mail to Scott Gillespie at: sgillespie@rspac.ivv.nasa.gov, or write to: BDM/RSPAC, 100 University Drive, Fairmont, WV 26554. Phone: (304) 367-8324, fax: (304) 367-8211.

News from NASA

Learning Technologies Channel Upcoming Schedule Announced

Kate Weisberg
kweisberg@mail.arc.nasa.gov

The following is a schedule of upcoming events on NASA's Learning Technologies Channel. For more information or access to these events, go to **http://quest.arc.nasa.gov/ltc/schedule.html**. Most past events are archived and clips are available at **http://quest.arc.nasa.gov/ltc/archive99.html**.

Wednesday, March 17
The ISS Tour from JSC
Live Broadcast: 10 a.m.-11 .am., Pacific
Join us for our regularly scheduled tour of the International Space Station mockup and training facility at the Johnson Space Center (JSC) in Houston, Texas.

Wednesday, April 7
Treasures of the Gulf Coast
Live Broadcast: 10 a.m.-11 a.m., Pacific
Join LTC and the Texas Parks and Wildlife Department to learn about how what you do with water in your neighborhood affects the creatures of the sea. Take a look at coastal habitats along Texas shores, including estuaries and sea grasses, and take a special look at coastal critters. High school students will demonstrate experiments to test water quality at the water's edge and survey wildlife, just like our biologists.

Wednesday, April 21
The ISS Tour from JSC
Live Broadcast: 10 a.m.-11 a.m., Pacific
Join us for our regularly scheduled tour of the International Space Station mockup and training facility at the Johnson Space Center (JSC) in Houston, Texas.

Tuesday, May 4
Spaceship Earth: Saving Aquatic Habitats
Live Broadcast; 10 a.m.- 11 a.m., Pacific
Join LTC and the Texas Parks and Wildlife Department to learn about NASA's water reclamation experiments for the space station. Using this biosphere concept, students can think about the Earth's precious water resources with new understanding. Then learn how Texas high school kids are saving aquatic habitats through service-learning. Talk with students from Amarillo, Weatherford, McAllen, and Mexico about their unique projects and find out how other students can get involved.

Wednesday, May 19
The ISS Tour from JSC
Live Broadcast: 10 a.m.-11 a.m., Pacific
Join us for our regularly scheduled tour of the International Space Station mockup and training facility at the Johnson Space Center (JSC) in Houston, Texas.

Nothin' but Net (cont.)

An Overview of Video Compression/Decompression

Erin Weikle
eweikle@rspac.ivv.nasa.gov

Video is a powerful, interactive communication tool that can turn a CD-ROM, a Web site, or a presentation into an educational, entertaining, dynamic experience. Video presents information in eye-pleasing, fluid motion, and while its qualities are certainly desirable, the expectations of new video involvement on the Web are high.

Most people don't realize the complexity involved in obtaining and capturing video, or the additional time and effort that must be spent compressing it. It can be a slow process, but one worth the outcome.

How are movies, video clips, and sounds reduced enough in size so that they can be played over the Web or placed on a CD? Implementing small files of video media is possible via a popular process know as codec. By compressing and decompressing a video file, the areas in which it can be used are amplified. As with any technology, there are sacrifices and decisions to be made in terms of speed versus quality. The intended use and method of display for each video will determine these tradeoffs.

How Does Compression Work?

Codec is an abbreviation for compression/decompression. Compression is used to dramatically reduce the size of a digital video file. The smallest clip of video can take up a huge amount of disk space—roughly five seconds of raw, uncompressed video would take up 150 megabytes of storage space.

All compression is achieved using mathematical formulas known as algorithms. Since there are some elements within data that are repeated more than others, compression algorithms take advantage of this redundancy. The greater the redundancy within the data, the greater the likelihood of successful compression. Since digital video contains a great deal of redundancy, such as similar backgrounds and scene or frame elements, video is very suitable for compression.

Compression can be achieved through software applications or video compression hardware. The current industry standards for video compression are Microsoft's Video for Windows and Apple's QuickTime. Video for Windows uses the AVI format and is commonly

used by video compression hardware and software developers. QuickTime is compatible with both Windows and Macintosh environments. Software compression codecs have the advantage of low cost, but they lack the compression speed of the hardware devices.

When selecting a codec, consider the compression level, quality of the compressed video, and the compression/decompression speed. To see a listing of available software and hardware codecs, visit Codec Central at **http://www.terran-int.com/CodecCentral/Codecs/index.html**. For information on what can be confusing digital video technology terms, visit **http://www.terran-int.com/manual/Manual_Parts/Glossary.html**.

All compression methods fall into one of two categories: lossless or lossy. Lossless compression schemes allow data to be recovered after decompression. With lossy compression schemes, the data cannot be retrieved after the decompression process.

Codecs compress using either temporal or spatial compression, and both work with the lossy schemes of compression. Temporal compression looks at the video information frame by frame. It finds the redundant file information and discards it. For each frame a pixel-specifying compression algorithm finds the scene changes as compared to a key or the first frame of the video sequence. This results in the removal of a large part of the file. Spatial compression will also reduce the overall file size by removing the redundant information, but it does so by defining changes based on coordinates rather than pixels.

Quality refers to the amount of definition and detail lost when image redundancies are discarded. Hardware codecs are expensive, but they deliver the highest-quality compressions, used mainly with videoconferencing.

Codec hardware presents a limitation to viewers, since most possess the same decompression hardware with which to view the data. Software codecs, such as freeware and commercial digital-video packages with built-in codecs (like the digital-video editor Cinepak has included free with QuickTime software), are widely used and often available on the Internet. They are less expensive (but deliver lower-quality compression) and have a longer compression time than hardware codecs. They do not provide the advanced control and quality that are achieved by compression hardware and required when displaying high-end video footage.

When selecting a codec, consider compression level, compressed-video quality, and compression/decompression speed. Video technology has the potential to achieve a variety of quality levels for various output arenas, and the technology is improving rapidly.

NASA's Learning Technologies Project (LTP) Bulletin is a monthly publication produced by the Remote Sensing Public Access Center (RSPAC). RSPAC is a cooperative project of NASA's Office of Aeronautics' High Performance Computing and Communications (HPCC) program, TRW, and West Virginia University. RSPAC is located at the NASA Software Independent Verification and Validation (IV&V) facility in Fairmont, West Virginia.

RSPAC/TRW
WVU/NASA IV&V Facility
100 University Drive
Fairmont, WV 26554

March 1999
Learning Technologies Project Bulletin

ADDRESS CORRECTION REQUESTED